Killer Controversy
Why orcas should no longer be kept in captivity

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Introduction

Since 1964, when a killer whale or orca (Orcinus orca) was first put on public display,1 the image of this black-and-white marine icon has been rehabilitated from fearsome killer to cuddly sea panda. Once shot at by fishermen as a dangerous pest, the orca is now the star performer in theme park shows. But both these images are one-dimensional, a disservice to a species that may be second only to human beings when it comes to behavioral, linguistic, and ecological diversity and complexity. Orcas are intelligent and family-oriented. They are long-lived and self-aware. They are socially complex, with cultural traditions. They are the largest animal, and by far the largest predator, held in captivity.

Evidence supports the position that orcas are ill-served by public exhibition. The early benefit of demonstrating to society that they are not mindless killers is uncontested,2 but is no longer served by continued display. It is not a matter of opinion that orcas do not adjust to captivity; it is a matter of fact. After 50 years of exhibiting orcas for human amusement, while at the same time studying them in the wild, we have learned enough about them in both settings to realize that orcas do not belong in captivity.

The Evidence

Longevity/survival rates/mortality

In 1995, Small and DeMaster published a peer-reviewed paper on the survivorship rates of several captive marine mammal species.3 This paper showed that, through the end of 1992 (the last year for which a complete set of annual data was available) orcas had significantly lower annual survival rates in captivity than in the wild. Their annual mortality rate (the inverse of survivorship) was more than two and a half times higher in captivity than in the wild. The data source for captive animals was the U.S. Marine Mammal Inventory Report, maintained by the National Marine Fisheries Service, an agency within the U.S. Department of Commerce. The data are provided to the agency by marine mammal public display facilities (henceforth called oceanaria); therefore, the database was if anything biased in favor of display.

The wild whales to which the captive whales were compared were the well-studied northeastern Pacific populations (off the coasts of Washington State and British Columbia), whose life history statistics had first been described in a peer-reviewed paper in 19904 and later confirmed in a 2005 technical publication.5 While other wild populations might show different life history profiles due to varying habitat quality, it is clear from this population that under objectively good environmental conditions,6 orcas are capable of life history trajectories similar to human beings. Both sexes reach sexual maturity at approximately 14, females give birth approximately every 5 years and go through menopause at approximately 40-45 years of age,
males live an estimated maximum of 60-70 years, and females live an estimated maximum of 80-90 years. The mean life expectancy for males is approximately 31 years; for females approximately 46 years.11

However, among captive whales, only two females, currently living, have passed the age of 40.12 This is after almost five decades of maintaining the species in captivity and out of over 200 individuals ever held for display.13 Only four females are currently in their mid- to late 30s,14 and of females who have died, only one or two were in their 30s at the time of their deaths (as exact ages at capture were not known, the exact ages of wild-caught captive whales cannot be determined). To date no captive males have lived longer than 40 years (the oldest, currently living, is in his mid-30s),15 and less than a handful have reached 30.16 The vast majority of captive orcas of either sex die before their early 20s, many still in their early teens.17

Thus to date the maximum lifespan of captive orcas has been about the same as the mean life expectancy of wild orcas. As a corollary, very few captive orcas who have died achieved the mean life expectancy of wild orcas.

The 1995 Small and DeMaster paper presented the strongest evidence to that time that orcas suffered significant negative impacts from being held in captivity, leading to lower survivorship. The nature of these impacts was not determined or discussed in this paper, but their existence could be inferred from the data. Captivity appeared to be a sub-optimal “habitat” for this species.

These findings, despite being emphasized by advocacy organizations, did not have a significant impact on the general public’s support for orca public display, nor did it start any real debate within the scientific community. The argument was made that captive-born orcas (whose sample size was too small through 1992 for analysis) would show better survivorship than wild-caught animals.18 It was also argued that survivorship would improve as husbandry methods improved.19

To address these arguments, survivorship was reanalyzed, using the same methodology and primarily the same data

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**SeaWorld says:**

In 2007, SeaWorld,7 which holds more captive orcas than any other company, responded to a set of questions sent by KGTU of San Diego8 and stated the following:

“We have often said that 30 years is as good an estimate of average killer whale lifespan as we currently have. Clearly animals can exceed that age, as evidenced by one of ours, Corky. She is at least 40 and perhaps as old as 42.

Peter F. Olesiuk, Graeme M. Ellis and John Ford, three of the world’s most respected marine mammal scientists and individuals who have studied longevity in wild whales for years, recently wrote in the proceedings of the 16th Biennial Conference on the Biology of Marine Mammals that female killer whales in their study group had a mean life expectancy of 31 years and males just 19 years”.

In 2011, Fred Jacobs, the Vice President of Communications at SeaWorld, gave a similar response to a blogger:9

“As far as [this scientific research], we are familiar with it... [One of the researchers] himself acknowledges the variability of wild life expectancy in this species: ‘During the period of growth, mean life expectancy of females was 46 years (31 for males)...’ Mean life expectancy of his study group, the Northern Resident Group in British Columbia, declined to 30 years for females and 19 for males.”

In both cases, SeaWorld was referring to studies by Canadian researchers Peter Olesiuk, Graeme Ellis, and John Ford and American researcher Ken Balcomb10 and was presenting their results out of context. The Pacific Northwest orcas experienced a period of unrestrained growth during the 1970s, 1980s, and early 1990s. During this time, their life history parameters were as presented in this report. The population then experienced a decline in survivorship from 1996 until
source as the Small and DeMaster paper and data compiled through the end of 2010. This new analysis determined that captive orca survivorship overall has grown worse in the past decade and a half. For animals who have entered captivity since 1993 (and thus have experienced only husbandry that has presumably improved since the Small and DeMaster study), survivorship has not changed. In addition, captive-born animals, although they have survived better than wild-caught animals through 2010, have not survived better than captive orcas overall did through 1992. Therefore the predicted improvement in survivorship has not in fact materialized, despite the increase in the proportion of captive-born animals making up the sample and despite supposedly continued improvement in husbandry techniques.

The most parsimonious explanation for this failure to show improved survivorship, despite the effort by oceanaria to advance husbandry techniques in the past 50 years, is that orcas are inherently unsuited to confinement. No improvements or advances in training, nutrition, veterinary care, husbandry, or transport can “fix” this poor survivorship.

The infant mortality rate in captivity (“infant” defined here as an animal six months of age or younger, including near- to full-term pregnancies where the calf does not survive birth (stillbirths)) is approximately 50%. Infant mortality rate in the wild is actually unknown, as newborn calves are usually not seen until they are approximately six months of age and calves who die earlier than this will not be observed, but it may be similar. Given the intense veterinary oversight during pregnancy and birth, it is notable that the captive infant mortality rate is so high.

Kalina was the original “Baby Shamu,” born at SeaWorld in September 1985 – the first successful captive birth for orcas anywhere in the world. She was born in the Florida park and died there in October 2010, apparently of an acute infection within hours of exhibiting a poor appetite and “discomfort”. Her age-at-death sets the current upper limit for captive-born orca longevity – 25 years. Kalina also spent time in SeaWorld’s Texas and California locations and produced four calves (by an age when, had she been a 2001, which coincided with a series of poor Chinook salmon runs.

These whales’ life history parameters shifted after 1996 and the mean life expectancy of the population fell to 30 years for females and 19 years for males.

SeaWorld ignores the fact that the second set of life expectancies was calculated when the orca population was in decline. It also ignores that the population began to increase again post-2001.

SeaWorld uses natural variability in survivorship across habitats (leading to variability in life history parameters) to imply that science does not know how long orcas live. However, habitat quality affects survivorship without affecting the intrinsic longevity of a species. Before the modern era, humans had life expectancies far below those of humans today because they did not have adequate protection from predators or the elements, food supplies were of varying quality and reliability, medical knowledge was limited or non-existent and so on. Nevertheless, before technology raised human life expectancies by reducing infant mortality, people were just as capable of living 100 years or more if circumstances were favorable.

The studies by Olesiuk, Ford, and colleagues showed that on average orcas can expect to live from 30 (male) to 50 years (female) when circumstances are favorable. If they live shorter lives elsewhere, then that is a reflection on habitat quality or other extrinsic factors, not on the species’ intrinsic longevity. SeaWorld attempts to use life history variability to support the claim that its orcas are living natural lifespans, but in fact it unintentionally supports the argument that concrete enclosures are sub-optimal for orcas, the equivalent of marginal, shifting, or degraded habitat.

SeaWorld’s KGTv response also claimed that “The simple fact is this:
typical female in the wild, she might have produced two or three). She was the fourth orca to die at a SeaWorld park within four months. The others were Taima (captive-born, aged 21), who died in Florida in June 2010 while giving birth; Taima’s calf, who was stillborn; and Sumar (captive-born, aged 12), who died in California in September 2010 of a twisted intestinal tract.33

SeaWorld has experienced nearly one orca death per year since its breeding program began – 26 orcas in 29 years, evenly spaced over that time, all but three of whom were younger than 25 years of age when they died and eight of whom were 12 or younger.34 Given the fact that the animals have access to 24/7 veterinary care and “restaurant-quality” food, this is a poor mortality record, particularly when considering the ages of the animals at death.

When a marine animal dies at an oceanarium, spokespeople will often make statements that death is a natural phenomenon and is to be expected and accepted.35 Yet at the same time they claim that captivity provides advantages (e.g., veterinary care, reliable food source, no predators or parasites) not available to the species in the wild.36 Therefore, according to oceanarium rhetoric, conditions in captivity are the same as in the wild when an animal dies but better at all other times. This inconsistent reasoning has unfortunately been accepted for years by the general public, the media, and even the scientific and regulatory communities.

**Age distribution**

Of more than 130 wild-caught orcas ever held for public display, only 20 survive in oceanaria around the world.37 Nine of these38 are older than the vast majority of captive orcas who have died and, given that they represent less than 10% of the wild-caught animals, should be considered outside the norm in terms of captive longevity.39 The remaining 34 living captive orcas are captive-born and therefore 25 or younger (after the death of Kalina, the oldest living captive-born orca was Orkid, who is now 25 years of age).40 Indeed, 18 of the surviving captive-born orcas are younger than 13 years of age.41

There have been over 200 orcas held in captivity, wild-caught and captive-born.42 Given the number of males and females, natural life expectancies, and the number of years since the first orca entered captivity, a third or more of these animals could reasonably be expected to still be alive today.43 Yet only approximately 20% of them are.

In the Pacific Northwest populations, about 46% of the whales are juveniles,44 whereas in captivity, about 56% are juveniles.45 In nature, an age distribution skewed toward younger age
classes is often seen in populations that have been in decline, where adult mortality has been abnormally high due to natural disasters, disease, hunting or other threats.\textsuperscript{52} Such populations see relative increases in younger age classes during subsequent population growth.\textsuperscript{53}

The captive orca population, however, has remained relatively stable since the 1970s (about 30-50 whales), suggesting that both the birth rate and adult death rate have remained abnormally high since the successful breeding program began in 1985. The former is likely the result of oceanaria breeding their female orcas at younger ages and at shorter intervals than in the wild.\textsuperscript{54} Ironically this may be contributing to the latter. Females (of any mammal species) who become pregnant too young or too often can experience physical harm that shortens their lives.\textsuperscript{55} In species with long juvenile dependency periods, forcing females to become pregnant too young can also lead to higher levels of infant mortality, as such mothers may not have the essential parenting skills or maturity to successfully rear a calf.

\textit{Causes of death}

The most common causes of death in captive orcas, wild-cought or captive-born, are pneumonia, septicemia, and other types of infection.\textsuperscript{56} That many infections turn lethal in captive orcas highlights the fact that wildlife often does not manifest clinical signs of illness until it is too late for treatment.\textsuperscript{57} This raises the logical question of whether veterinary care provides a significant advantage to captive wildlife. Clearly it helps some animals, but others die before treatment can be started or take effect.

A contributing factor to infection-caused mortality in captive orcas may be immunosuppression. Pathogens or injuries that the immune systems of wild orcas would successfully combat or manage may be fatal to captive orcas, due to chronic stress, psychological depression, and even boredom. All of these can cause immune system dysfunction or other health problems in many species, including cetaceans.\textsuperscript{58}

\textbf{SeaWorld says:}

SeaWorld characterizes its enclosures, husbandry, training practices, veterinary care, and conservation, research and education programs at its three theme parks as “world class” and “unparalleled.”\textsuperscript{46} Many of its educational materials are also readily available on the Internet.\textsuperscript{47} However, in several instances the information presented is unclear or confusing.

\textit{Longevity}

In a recent \textit{Killer Whales Teacher’s Guide},\textsuperscript{48} SeaWorld stated that the typical lifespan of orcas is “probably” 25 to 35 years, and in the current \textit{Killer Whales Animal InfoBook}\textsuperscript{49} SeaWorld claims that: “No one knows for sure how long killer whales live.” This is followed by an observation that scientists have found that orcas in the North Atlantic “may live at least 35 years” (emphasis added). A little later, however, the \textit{InfoBook} notes that scientists in the northeastern Pacific “believe that if a killer whale survives the first six months [of life], a female’s life expectancy is 50 years and a male’s is 30 years” (emphasis added).

SeaWorld attempts to maintain a degree of ambiguity about the longevity of orcas by providing its audience with conflicting and confusing information and by using terms such as “may” or “believe” when discussing scientific data. This effort to cast doubt on the best available science regarding orca longevity is counter to the education standards SeaWorld has adopted.\textsuperscript{50}

\textit{Collapsed dorsal fins}

All captive male orcas have collapsed dorsal fins as adults,\textsuperscript{51} most completely folded over the back. Because of their visibility, these fins tend to draw attention and questions from the public. SeaWorld attempts to
**Dental health**

The high rate of lethal infection may also be a function of poor dental health. Captive orcas routinely show damaged dentition, primarily broken and worn teeth with the pulp exposed. This is in contrast to wild orcas: many show little or no tooth wear, while those who do tend to specialize in prey with abrasive morphology. Only broken teeth in wild orcas are rare.

In captivity, the abrasion and breakage comes not from prey, but from gnawing on concrete walls or steel gates that separate the various sections of an enclosure complex (there are usually at least two enclosures – a primary and a medical – and in larger complexes there can be as many as seven enclosures, all separated by metal gates), often in shows of aggression to animals in neighboring enclosures or due to boredom. Photographs on the Internet of captive orcas in the open-mouth position, typical of individuals soliciting fish, substantiate this, showing many broken or worn teeth. Tooth breakage invariably leaves the pulp exposed.

In captive orcas, food plugs in the exposed cavity can serve as direct routes for infection to enter the body. According to former trainers, when a tooth breaks, a variable speed drill is used to drill holes directly through the pulp, in a modified pulpotomy. Judging from behavioral reactions, this is uncomfortable for the whale. Once the drilling is complete, the tooth is not sealed or capped and therefore “trainers must irrigate (flush) the bored out [tooth] two-three times each day, for the rest of the orca’s life, to prevent abscess, bacteremia, and sepsis.”

Poor dental health is a known cause of many veterinary/medical conditions, including heart disease and pneumonia. In the case of captive orcas, these open holes “represent a direct route for pathogens to enter the blood stream where they can then be deposited into the tissue of various organs throughout the body, such as the heart or kidney.” Yet there is a paucity of oceanarium-published literature on the connection between captive orca dental condition and overall health/mortality, although it seems increasingly likely that poor dental health is involved in – or may even be the direct cause of – many of the lethal infections observed in captive orcas.
It is telling that oceanaria that display orcas, claiming to be experts on orca health and veterinary care, performing necropsies on all animals who die, have not published more widely in the zoo or veterinary literature on the issues related to captive orca dental health.75 This failure in veterinary transparency is counter to their public position that they promote education, conservation, and good science.76

Aberrant behavior

The only recorded fatal attack by one orca on another occurred in captivity.77 Incompatibility among captive orcas is frequent, with certain individuals bullied by others, resulting in lacerations and other wounds, and eventually needing separation from dominant individuals.78 In the wild, aggression has been only rarely observed; where it was, serious injuries did not result.79

Although there are records of orca remains found in the stomachs of orcas,80 these were more likely to have been scavenged than the result of active predation or cannibalism.81 The potential costs to one group of orcas targeting another would likely outweigh the benefits of successful predation.82 In short, aggressive encounters between orcas in the wild are unlikely to escalate to dangerous levels.

The obvious physical difference between the two “habitats” is that a subordinate animal cannot escape and has no choice regarding his or her companions in captivity. In the wild, a subordinate animal can flee in three dimensions from an aggressor and can actively avoid animals with whom he or she is incompatible.83 The obvious social difference is that captive orca groups are wholly artificial, made up of unrelated animals who do not necessarily get along. Paradoxically for such a social animal, it might be better for a captive orca to be solitary, and interact only with long-term, compatible human caretakers, than to be in a group of other whales who are hostile or behave aggressively.

Injurious aggression is not the only aberrant behavior observed in captive orcas. Captive females have been known to reject or act aggressively toward their newborns84 or

SeaWorld says:

The Occupational Safety and Health Administration issued a citation to SeaWorld on 23 August 2010 in the death of trainer Dawn Brancheau for a “willful” violation of safety regulations (“willful” is defined as an act committed with plain indifference to or intentional disregard for employee safety and health).73 In a subsequent statement, SeaWorld said that its trainers are “among the most skilled, trained and committed zoological professionals in the world today. The fact that there have been so few incidents over more than 2 million separate interactions with killer whales is evidence not just of SeaWorld’s commitment to safety, but to the success of that training and the skill and professionalism of our staff”.74

However, the proportion of interactions that result in incidents is not the proper statistic to use. An analogy would be if a particular factory machine can be used thousands of times before a part fails and seriously injures or kills a factory worker. If a significant number of these machines are in use and some proportion of them have this deficiency, the question then becomes how many of them will eventually fail, not how many times these affected machines can be used before they fail. If only a very small proportion of the machines have this deficiency (say, less than 2% out of the total number of machines in use), this might be a tolerable risk for the industry in question. How great a risk is tolerable to society depends on how important the product produced is and how great the cost would be of replacing or redesigning the machine. However, the risk begins to look prohibitive if the proportion of deficient machines is sufficiently high. If the failure rate reaches a level where the public, the government, and even the manufacturer conclude that it is too high, then the machines would be recalled.
simply fail to effectively care for or nurse them.\textsuperscript{86} While this type of mother-calf dysfunction may also occur in the wild, only a small number of “orphaned” calves have been observed there\textsuperscript{87} and maternal inattention or aggression is rarely observed.\textsuperscript{88}

The aberrant behavior seen in captive orcas is suggestive of abnormal social and psychological development of animals raised in or born into artificial social groups and “habitats.” This conclusion is further supported by the history of aggressive interactions between orcas and people in captivity.

\textit{Human injuries and deaths}

Throughout recorded history, there have been no reliable reports of wild orcas killing a human being.\textsuperscript{89} In contrast, four people have been killed by captive orcas. Three orcas drowned a part-time trainer in 1991.\textsuperscript{90} One of these three was involved in the death of a member of the public eight years later\textsuperscript{91} and this same whale killed his long-time trainer 11 years later.\textsuperscript{92} A fourth whale killed his trainer only nine weeks earlier.\textsuperscript{93}

There have been very few reports of serious injuries inflicted by wild orcas on humans; one surfer required stitches in his leg in 1972.\textsuperscript{94} The few other reported incidents were minor and resulted in little or no injury.\textsuperscript{95} In contrast, there have been dozens of significant incidents between people and captive orcas, including serious injuries requiring hospitalization, throughout the 50 years this species has been on public display.\textsuperscript{96}

The contrast is clear – in the wild, despite centuries of encounters between seafarers (including modern researchers) and orcas, there have been no human deaths and very few serious injuries recorded. Yet in only 50 years of placing orcas in artificial proximity to people, there have been dozens of serious injuries involving dozens of different animals and four deaths involving four different animals. Captivity not only leads to early death for the animals – it puts people at significant risk of injury and death as well.

\textbf{Conclusion}

We maintain that the only logical conclusion, after considering the preceding evidence, is that orcas do not belong in captivity. They do not thrive: they are physically harmed, living shorter lives, and they are psychologically harmed, injuring each other and humans in a way rarely or never observed in the wild.

As noted earlier, there have been over 200 orcas held in captivity since 1964. Fifty-four of them are currently living. Of these 200+ animals, at least two dozen (\geq 10\%) are known to have been involved in serious incidents that threatened the lives or safety of people interacting with them (trainers and others).\textsuperscript{85} It is possible this number is even larger (oceanaria do not publicize incidents that occur outside of public view). Four whales – roughly 2\% – have killed their trainers. Therefore the “failure rate” for captive orcas is in the double digits and the fatality rate is 2\%. Together these rates might lead to a recall if these animals were machines.

Given that the product here is entertainment-based performances, this level of risk – to the orcas and their trainers – is not justified. Educational opportunities provided by various media and advanced technology can replace live orca exhibits.
Considering orca natural history, it is unsurprising that orcas do not thrive in captivity. They are kin-bonded creatures, with a long dependency period on the mother and life-long family ties to her, their siblings and more distant relations.\(^\text{100}\) When in captivity, they are kept in artificial social groups with no resemblance to those in nature. They are cooperative predators, whose home ranges are hundreds if not thousands of square kilometers in size and who can and often do swim 100 kilometers in a day.\(^\text{101}\) When in captivity, they are made to exist inside a comparatively small concrete enclosure, less than one ten-thousandth of one percent normal habitat size.\(^\text{102}\) Captivity cannot adequately provide for such large, social, wide-ranging predators.\(^\text{103}\)

A captive orca bears little resemblance to a wild one and the evidence is mounting that these animals, raised within or born into profoundly abnormal circumstances, are themselves abnormal. However, for almost 50 years oceanaria holding orcas have been telling the public that captive orcas thrive and indeed that they might even be better off in human care than facing the challenges of a wild existence.\(^\text{104}\) The facts show otherwise.

**Ending the public display of orcas**

In early 2014, there are 54 orcas in captivity world-wide, held in 13 facilities in eight countries. Captive breeding occurs in only some of these facilities, most notably the SeaWorld parks in the United States, Kamogawa Sea World in Japan, and Marineland Antibes in France. The vast majority of births occur at SeaWorld parks. These circumstances support the contention that ending the public display of orcas is manageable and would have only minor economic impacts, primarily affecting only a small number of public display facilities.

Captive breeding of this species should end, as it serves no conservation purpose.\(^\text{105}\) Live trade in orcas should also end.\(^\text{106}\) The population of captive orcas can be eliminated through attrition, with the animals currently alive evaluated for continued display, retirement to sea pens, or rehabilitation and possible release to the wild if appropriate.

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**SeaWorld says:**

On 24 February 2010, Tilikum, an approximately 30-year-old male orca held at SeaWorld Florida, brutally killed his long-time trainer, Dawn Brancheau. On 3 March 2010, The Humane Society of the United States (HSUS) sent a letter to the Blackstone Group, the corporate parent of SeaWorld, requesting a meeting and offering to discuss a proposal for his future. The proposal was not to release Tilikum into the wild, but to retire him to a sea pen. The HSUS noted that he could be on public view,\(^\text{97}\) for a fee, so the company would not suffer an economic loss.

SeaWorld refused this proposal and housed Tilikum primarily in the back tank of the Florida complex for the next 13 months, not using him in the show. Trainers did not approach close enough to touch him during this time. As of early 2014, he is once again used in the show, but he is still not touched by his trainers.\(^\text{98}\)

In its proposal to Blackstone, The HSUS noted its experience with the Keiko Project,\(^\text{99}\) which the organization had managed during the final 20 months of Keiko’s life. In a reply dated 16 March 2010, SeaWorld’s president, Jim Atchison, stated the following:

“\[I\] am familiar with your role in the tragic release experiment involving Keiko...It illustrates the cruelty of attempting to return a long-captive marine mammal to the wild... 

“HSUS proceeded with an experiment that...cost an innocent animal his life... 

“The release of Keiko was a disgraceful act. It was executed in a way that was, by any standard, irresponsible and reckless. To cite the Keiko experiment as anything other than a waste of valuable resources and a failure with tragic consequences for this animal is to rewrite history.”
The 13 affected oceanaria would thus have a number of years (possibly 30 or more in some cases)\textsuperscript{110} to transition their exhibits from orca performances to another medium. To protect trainers during the transition period, all in-water work with these animals should end.

We emphasize that we are not proposing blanket closure of oceanaria. We are proposing a phasing out of orca exhibition, taking as long as three decades, giving oceanaria sufficient time to repurpose their orca enclosures. We believe this is eminently reasonable and will minimize the financial impacts of ending this practice.

![Image of orcas](image)

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\textit{What next?}

As a society, we are paying more attention to the well-being and psychology of captive animals, and it is logical that we should look at the record for captive orcas. The purpose of this report is to set out the evidence that orcas do not belong in captivity. It is not justified to continue their display for entertainment or even for education, especially when that education is biased toward information that supports a corporate narrative\textsuperscript{111} rather than good science.

As long as the public buys tickets to see orcas perform, oceanaria are unlikely to voluntarily close orca exhibits. Therefore it is up to the public, as well as the media, the regulatory agencies, and the scientific community, to consider and weigh the evidence and make the only logical deduction. Orcas are too large, too intelligent, and too behaviorally and socially complex to adequately provide for

"You write in triumphant terms about an animal that was never accepted by wild whales, suffered serious injuries, and died prematurely and unnecessarily. Keiko should have lived out his life in the company of other members of his species in an accredited and professionally operated zoological institution. That would have been the humane thing to do."

SeaWorld’s claim that Keiko died “prematurely” at the age of 26 years is inconsistent with the company’s own history. Twenty-five of the past 26 SeaWorld orca deaths were of animals younger than this, most by many years. The five orcas who died most recently, in 2010 and 2012, were all younger than Keiko was when he died.

In fact, Keiko lived for five years in Scandinavian waters. Tracked by satellite, he swam between Iceland and Norway in summer 2002, crossing the north Atlantic over the course of three weeks. He arrived in Norway in good health.\textsuperscript{107} He interacted over the course of three summers with wild whales, although it is true he was never fully accepted by them. He was never seriously injured, although he suffered scrapes on his head when he encountered ice during his second-to-last winter in Norway. These scrapes were fully healed within weeks.\textsuperscript{108}

SeaWorld’s strong condemnation of the Keiko Project as a failed experiment is disingenuous, given that the company’s initial efforts in the 1960s to maintain orcas in captivity could also be viewed as experimental.\textsuperscript{109} SeaWorld rewrites history whenever it refuses to acknowledge the failures in those early days, which cost many animals their lives.

Finally, it should be noted that SeaWorld was always in a position to do the self-described "humane thing" for Keiko. It could have acquired him at any time during his tenure in Mexico City, where he was on display for 11 years, especially once he was
in concrete enclosures. No more orcas should have to die prematurely; no more trainers should be put at risk. It is time to accept that we have been wrong in our assumptions. The orcas deserve no less.

**Acknowledgments**

John Kielty of The Orca Project ([http://www.theorcaproject.com](http://www.theorcaproject.com)) reviewed the Marine Mammal Inventory database for relevant data on captive orcas for the annual survivorship rate (ASR) analysis. He created a comprehensive Excel spreadsheet and researched other sources to identify missing data from the database (see [http://theorcaproject.files.wordpress.com/2011/03/mmir-deficiency-evaluation-killer-whales2.pdf](http://theorcaproject.files.wordpress.com/2011/03/mmir-deficiency-evaluation-killer-whales2.pdf)). From this database, Katheryn Patterson, a graduate student at George Mason University, computed the 2011 ASRs. The Animal Welfare Institute is extremely grateful to them both for their work.

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All URLs were accessed on 27 March 2014.


6 The “Pacific Northwest” marine ecosystem of the U.S. and Canada is rich in biological resources (e.g., Hoyt, E. 1984. Orca: The Whale Called Killer. Camden House, Ontario, 287 pp.), although increasing human-caused habitat degradation is a growing threat to its productivity (e.g., Petition to list the southern resident killer whale (Orcinus Orca) as an endangered species under the US Endangered Species Act, May 1, 2001, available at http://www.biologicaldiversity.org/species/mammals/Puget_Sound_killer_whale/pdfs/petition.pdf).

7 Prior to 2009, SeaWorld’s corporate name was SeaWorld, Inc. In 2009, the company was sold and became known as SeaWorld Parks & Entertainment, Inc. In this report, it is referred to as SeaWorld and the individual parks are referred to as SeaWorld California, Texas, and Florida. See also endnote #29.


11 Olesiuk et al. 1990 op. cit.; Olesiuk et al. 2005 op. cit.

12 Corky, at SeaWorld California and Lolita, at the Miami Seaquarium; both are over 45 years of age.

13 Dozens of contemporaries from captures in the 1960s and early 1970s could potentially still be alive and of similar age as these two females, but most died within a few years of capture — see http://www.orcahome.de/deaddied.htm.

14 Katina, Kasatka, Kiska, and Freya — the first two are at SeaWorld parks, Kiska is in Marineland Ontario, and Freya is at Marineland Antibes in France.

15 Ulises, at SeaWorld California.

16 http://www.orcahome.de/orcstat.htm; Marine Mammal Inventory Report, maintained by the U.S. National Marine Fisheries Service. Tilikum, a male at SeaWorld Florida, is currently over 30 years of age.

17 Ibid.

18 Small and DeMaster op. cit.


20 Olesiuk et al. 2005 op. cit.

21 Ford et al. 2005 op. cit.

22 Ibid.


24 In 1995, the calculated annual survival rate (ASR) for captive orcas overall (wild-caught and captive-born, males and females, calves and non-calves) was 0.937. Looking only at non-calves (defined in the 1995 analysis as animals who survived beyond the first year of life), the ASR was 0.938, which was statistically lower than the non-calf ASR of 0.976 for wild orcas. (A 0.938 ASR equates to a 6.2% annual mortality rate, which was roughly 2.5 times higher than the annual mortality rate of non-calves in the Pacific Northwest populations.) In 2011, the ASR for captive
orcas overall was 0.916 – this equates to an 8.4% annual mortality rate. Looking only at non-calves, the 2011 ASR was slightly higher – 0.927 vs. 0.916 – but still lower than in 1995. These values do not include stillbirths, miscarriages, deaths of fetuses in the womb when the mother dies, escaped animals, released animals, or animals with unknown acquisition or death dates.
21 The 2011 ASR for all orcas who have entered captivity since 1 January 1993 (this includes by birth, rescue, stranding, and capture) was 0.935.
22 The 2011 ASR for all captive-born orcas (this category did not have a large enough sample size for analysis in 1995) was 0.937. This is the same value as overall survivorship through 1992, although it is higher than the overall ASR through 2010 (0.916). Wild-caught orcas have shown the lowest survivorship in captivity through 2010, with an ASR of 0.909 – an annual mortality rate of 9.1%. This category is now skewed toward much older animals.
23 The 2011 ASR for captive-born calves (defined as six months of age or younger, including stillbirths) is 0.498, or a 50.2% mortality rate. This value excludes known miscarriages. Because some stillbirths may go unreported, this figure is probably an underestimate. See also Rose, N.A., Parsons, E.C.M., and Farinato, R. 2009. The Case Against Marine Mammals in Captivity. The Humane Society of the United States and the World Society for the Protection of Animals, Washington, D.C., 76 pp., available at http://www.humanesociety.org/assets/pdfs/marine_mammals/case_against_marine_captivity.pdf.
24 Olesiuk et al. 2005 op. cit.
25 SeaWorld holds more than half of all the world’s captive orcas (it currently owns 29 orcas, including six held by other parks) and was one of the first oceanaria to display this species, beginning in 1965. Its iconic orca is “Shamu,” a stage name used by several whales during performances. See also endnote #7.
30 http://www.orcahome.de/orcastat.htm; N. Rose, unpublished data.
31 See, for example, http://www.practicalfishkeeping.co.uk/content.php?sid=3745, quote by Allan Zeman, chairman of Ocean Park, Hong Kong: “[Death is] quite normal...people die and babies are born every day”; see also Hutchins, M. 2006. Death at the zoo: The media, science, and reality. Zoo Biology 25: 101-115.
33 http://www.orcahome.de/orcastat.htm; one of these is Morgan, a young whale rescued in June 2010 after being found alone and emaciated in the Wadden Sea and was transferred to Loro Parque in the Canary Islands in late 2011, after being held temporarily at the Harderwijk Dolfinarium in the Netherlands. Eight were captured from the Sea of Okhotsk in Russia in 2012 (one) and 2013 (seven). Two of these are now believed to be in China.
34 These nine are, in descending order of age, Corky (F), Lolita (F), Katina (F), Kasatka (F), Kiska (F), Ulises (M), Freya (F), Tilikum (M), and Bingo (M). As of the date of publication of this report, the oldest, Corky and Lolita, are approximately 48 years of age; Bingo, the youngest, is approximately 32 years old.
37 Ibid.
38 Ibid.
39 The sex ratio of the captive population has been roughly 50:50, although there have been slightly more females than males in the group (http://www.orcahome.de/orcastat.htm). Had the earliest captives been juveniles when taken (this is the general rule when targeting individuals during a capture, as younger animals adapt better than older ones) and had they survived, none would be older than 50 or 55 years of age. As 46 is the mean life expectancy for female orcas in the wild – which is roughly 20 years short of the maximum estimated lifespan for male orcas – it is conservative to estimate that about a third or more of these 200+ whales would still be alive today if survivorship in captivity was the same as in the wild and certainly if it was better than in the wild. That is, at least half of the females – the mean is not the median, but it is a good approximation – and some additional number of males would still be alive. This is a very conservative estimate, as in fact more than half of the females
should still be living, as they would be far younger than 46.

44 Olesiuk et al. 2005 op. cit.
47 http://www.seaworld.org/.
48 This teacher’s guide is no longer available on the Internet.
53 Ibid.
54 In the wild, as noted earlier, first birth occurs at approximately 14 years of age in females. This age may be biased upward, given the potentially high number of first-born calves who die before researchers can observe them (Duffield, D.A., Odell, D.K., McBain, J.F., and Andrews, B. 1995. Killer whale (Orcinus orca) reproduction at Sea World. Zoo Biology 14: 417-430). Nevertheless, it remains likely that first conception/birth occurs several years later in wild orcas than in captive ones, as captive-born females have given birth for the first time at the age of 8 (e.g., Kalina, Taima, Kohana), meaning conception took place as young as 6. The interbirth interval in the wild is approximately five years; in captivity it is as short as two or three.
59 See, for example, Ford et al. 1994 op. cit.
63 Jett and Ventre op. cit.
64 http://www.orcahome.de/orcastat.htm - click on each animal’s name to see individual photo galleries.
65 Jett and Ventre op. cit.; Graham and Dow op. cit.
66 Jett and Ventre op. cit.; Graham and Dow op. cit. argued that invasive care (such as drilling) was not necessary for worn teeth, but the animal evaluated in their paper had worn rather than broken teeth. The latter’s adequate care may require different methods.

Jett andVentre op. cit.

Ibid., p. 2.


Jett andVentre op. cit., p. 3.


See http://www.cnn.com/2010/US/08/23/seaworld.fine/index.htm – the original statement from SeaWorld has been removed from its website, as its archive only holds material from the previous six months.

Glatt et al. op. cit.

AMMPA educational standards op. cit.; http://www.ammpa.org/.


N. Rose, personal observation.


Two groups of orcas would essentially be evenly matched. The attacker(s) could be seriously injured if the target animal(s) mounted a defense or could expend considerably more energy than would be recouped if the target animal(s) chose to flee.

Waples and Gales op. cit.

Halyn, born in 2005, was raised by hand at SeaWorld Texas after her mother Kayla failed to nurse her and died aged 2.5 years, see http://en.wikipedia.org/wiki/List_of_captive_orcas#Kayla; both Àdán, born at Loro Parque in October 2010 and alive as of early 2014, and Vicky, born in August 2012 and dead in 10 months, were rejected by their mother Kohana and were raised by hand, see http://digitaljournal.com/article/352404; Sumar was separated from his mother Taima when less than four months of age, after she “attacked” him, see


The best example of this was Corky, who became pregnant seven times. One of the calves was stillborn and two were miscarried, while of those born alive, none lived longer than 48 days. She seemed unable or unwilling to care for them properly, see http://en.wikipedia.org/wiki/List_of_captive_orcas#Corky.

These three were Springer (A73) and Luna (L98) of the northeastern Pacific populations and Morgan (see endnote #37).

N. Rose, personal observation.

Hoyt op cit.


97 Indeed, there is no other legal option, as the Marine Mammal Protection Act does not allow for long-term captive holding of marine mammals in the U.S. except for the purpose of public display or scientific research.

98 See, for example, http://www.dailymail.co.uk/news/article-1371403/Tilikum-SeaWorld-puts-dangerous-whale-killed-trainer-show.html.

99 Keiko was the orca who starred in the 1993 Warner Brothers movie “Free Willy.”

100 Ibid.

101 Ibid.

102 Rose et al. op. cit.


104 See, for example, McBain 1999 op. cit.

105 Oceana claim that their captive breeding programs are conservation programs, but orcas as a species are not endangered or threatened; where they face threats the problem is not lack of reproductive success but habitat degradation affecting survival; and no captive-born animals are destined for release to the wild. These elements do not meet any common definition of conservation breeding (e.g., Mallinson, J.C. 1995. Conservation breeding programmes: An important ingredient for species survival. Biodiversity and Conservation 4: 617-635; International Union for the Conservation of Nature (IUCN) Policy Statement: “Reintroduction to the wild should be the ultimate objective of all captive breeding programmes,” IUCN Caring for the Earth, October 1991, p. 7).


110 Several captive orcas are less than three years of age at the time of this report’s publication.